

REMARKS

Claims 1-13 remain in the application. By this amendment claims 3, 5, 7-9, and 11-13 have been amended, new claims 27-30 have been added, and claims 1 and 2 have been canceled without prejudice. Claims 14-26 were canceled without prejudice in response to a requirement for restriction.

REJECTION OF CLAIMS 1-4, 9, 11, AND 13 UNDER 35 U.S.C. § 102(b)

Claims 1-4, 9, 11, and 13 were rejected under 35 U.S.C. § 102(b) as being anticipated by Alers et al., U.S. Patent No. 6,320,244. This rejection is respectfully traversed.

Alers et al. teach in column 5, lines 7-26, that with reference to FIG. 2, a detailed embodiment of the capacitor 24 includes a high-k composite dielectric stack 46 made up of first, second and third metal oxide layers 64, 66 and 68. The first and third metal oxide layers 64 and 68 include a metal oxide with a relatively high dielectric constant such as TiO₂, ZrO₂ and RuO₂. The second metal oxide layer 66 can be formed of Ta₂O₅.

The capacitor 24 includes metal electrodes 44 and 48 which may include a metal nitride, such as TiN, of which the titanium is capable of breaking down or reducing the metal oxide of the second metal oxide layer 66, into, for example, elemental tantalum. However, the high-k first and third metal oxide layers 64 and 68 substantially block the breakdown or reduction of the metal oxide of the second metal oxide layer 66 by the metal of the electrodes 44 and 48. Thus, the capacitor 24 having metal electrodes 44 and 48, includes a capacitor dielectric 46 that is a high-k, high quality and low leakage dielectric, and which prevents the reduction of the dielectric 46 by the metal of the electrodes 44 and 48.

Applicants, on the other hand, teach on page 10, lines 8-32, and continuing to page 12, lines 1-2, that with reference to FIG. 3, an intermediate structure 66 is formed on capping layer 64. In accordance with one embodiment, intermediate structure 66 is a two-layer structure comprising a layer of copper oxide 68 formed on capping layer 64 and a layer of tin oxide 70 formed on copper oxide layer 68. By way of example, copper

oxide layer 68 may be formed by reacting copper tetramethylheptanedionate (THD) with ozone using atomic layer deposition and tin oxide layer 70 may be formed by reacting an organometallic comprising tin with nitric oxide using atomic layer deposition.

Preferably, copper oxide layer 68 has a thickness ranging from approximately 5 Å to approximately 300 Å and tin oxide layer 70 has a thickness ranging from approximately 1 Å to approximately 30 Å. The intermediate structure is also referred to as a precursor seed material. ... Referring now to FIG. 7, semiconductor component 10 is heat treated in an ambient comprising a combination of nitrogen, hydrogen, and ammonia to form a multi-metal seed layer 66A. By way of example, the temperature range of the heat treatment is from approximately 150 degrees Celsius (°C) to approximately 400 °C and the duration of the heat treatment ranges from approximately 30 sec to approximately 60 minutes. After the heat treatment, the multi-layer intermediate structure becomes a single layer multi-metal seed layer; thus, the letter "A" has been appended to reference number 66. It should be understood the composition of the heat treatment ambient, the temperature range of the heat treatment, and the duration of the heat treatment are not limitations of the present invention. Preferably, the multi-metal seed layer has a thickness of less than approximately 300 Å. Even more preferably, the multi-metal seed layer has a thickness ranging from approximately 50 Å to approximately 200 Å. In an embodiment wherein the multi-metal seed layer includes tin, it is desirable for the tin to have a concentration ranging from approximately 0.1 atomic percent to approximately 10 atomic percent.

Accordingly, applicants' amended claim 3 calls for, among other things, forming a multi-metal seed layer on the barrier layer by forming a first metal oxide layer on the barrier layer, forming a second metal oxide layer on the first metal oxide layer, and reducing the first and second metal oxide layers. Applicants' amended claim 9 calls for, among other things, forming a multi-metal seed layer on the barrier layer by forming a first metal oxide layer on the barrier layer, forming a second metal oxide layer on the first metal oxide layer, forming a third metal oxide layer on the second metal oxide layer, and reducing the first and second metal oxide layers. At least these elements of applicants' claims 3 and 9 are not included in the relied on reference of Alers et al. Because all

elements of applicants' claims 3 and 9 are not included in the relied on reference of Alers et al., the relied on reference cannot anticipate applicants' claims 3 and 9.

Claims 4, 11, and 13 depend from claim 3 and are believed allowable over the relied on reference of Alers et al. for at least the same reasons as claim 1. Claim 4 further sets out that reducing the first and second metal oxide layers includes heating the first and second metal oxide layers to a temperature of at least 150 degrees Celsius. At least this element of applicants' claim 4 is included in the relied on reference of Alers et al., further precluding anticipation of claim 4.

ALLOWABLE SUBJECT MATTER

Claims 5-8, 10, and 12 were objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Claims 5 and 12 have been amended to be in independent form including all the limitations of the base claim and intervening claims. Accordingly, claims 5 and 12 are believed to be in condition for allowance.

Claims 7 and 8 have been amended to depend from claim 3 and are believed allowable for at least the same reasons as claim 3.

NEW CLAIMS

New claims 27-30 have been added.

New claims 27 and 28 depend from claim 3 and are believed allowable for at least the same reasons as claim 3.

New claims 29 and 30 depend from claim 5 and are believed allowable for at least the same reasons as claim 5.

CONCLUSION

No new matter is introduced by the amendments herein. Based on the foregoing, applicants believe that all claims under consideration are in condition for allowance. Reconsideration of this application is respectfully requested.

Respectfully submitted,

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